TH

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/706,472	11/10/2003	Thomas James Batzinger	RD-28,303-1	6737

6147 7590 08/09/2007

GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
PATENT DOCKET RM. BLDG. K1-4A59
NISKAYUNA, NY 12309

EXAMINER	
SMITH, NICHOLAS A	

ART UNIT	PAPER NUMBER
1753	

MAIL DATE	DELIVERY MODE
08/09/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/706,472
Filing Date: November 10, 2003
Appellant(s): BATZINGER ET AL.

MAILED
AUG 0 9 2007
GROUP 1700

Penny A. Clarke
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 23 April 2007 appealing from the Office action mailed 22 December 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,355,156	LI et al.	3-3003
2003/0079989	KLOCKE et al.	5-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-2, 8, 10-12, 15, 18 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Li et al. (US Patent 6,355,156) as submitted by applicant in information disclosure statement on 11/10/2003.

In regards to claims 1 and 12, Li et al. discloses a method of monitoring machining in an electrochemical machining tool assembly (Figure 1) having at least one electrode (**12**) arranged across a gap from workpiece (**16**), the electrode being energized by application of a potential difference (**20**), exciting at least one ultrasonic sensor to direct an ultrasonic wave toward a surface of the electrode and receiving a reflected ultrasonic wave from the surface of the electrode using the ultrasonic sensor, the reflected ultrasonic wave comprising a plurality of reflected waves from the surface of the electrode and from a surface of the workpiece (col. 2, lines 38-43).

However, Li et al. does not specifically disclose delaying the excitation of the ultrasonic sensor a dwell time after a reduction of the potential difference or in the transition from a pulse-on to a pulse-off state across the electrode and the workpiece occurs. Li et al. does teach reducing the potential difference or using pulsed power supply so as to minimize the generation of gas bubbles in order for a more accurate measurement to be made (col. 5, lines 40-45). Since the measurement using the ultrasonic sensor is made after generation of gas bubbles is lessened by a decrease in potential difference or in the pulse-off state of a pulsed power supply, there is an inherent delay (i.e., a dwell time) between the decrease in DC voltage and measurement made by ultrasonic sensor due to the inherent time it takes to transmit

electronic signals. Therefore, a dwell time would be inherent to the method disclosed by Li et al.

In regards to claim 15, Li et al. discloses the features that are the same as in claim 1 for the same reason as above. Li et al. discloses the features of flowing electrolyte (**18**) through and flushing electrolyte (**18**) from the gap (**26**) using a pump system (col. 3, lines 62-67 and col. 4, lines 1-3). Li et al. also discloses feeding at least one electrode toward the workpiece (col. 3, lines 54-55).

In regards to claims 2 and 18, Li et al. discloses a method of using pulsed electrochemical machining (col. 5, lines 40-45).

In regards to claim 8, Li et al. discloses at least two electrodes each being arranged across a respective gap from the workpiece (Figure 1).

In regards to claims 10 and 20, Li et al. teaches a method of analyzing ultrasonic sensor signals to determine the size of the gap between the electrode and the workpiece (col. 4, lines 43-57).

In regards to claim 11, Li et al. teaches an ultrasonic transducer (col. 5, lines 17-21).

In regards to amendment "synchronizing the excitation of the ultrasonic sensor to a machining cycle of the electrochemical machining (ECM) tool, the synchronizing comprising" in claims 1, 12 and 15, Li et al. does not specifically disclose an active step of synchronizing the sensor to a machining cycle of the ECM tool. However, synchronizing is inherent in operation of the ultrasonic sensor with the ECM tool in that excitation of the ultrasonic tool is suggested during the off time interval of pulsed

electrochemical machining (col. 5, lines 40-45). Multiple measurements of the ultrasonic sensor would be inherently made in that the ultrasonic sensor is used in a method of ECM monitoring, and thus requiring multiple thickness measurements (claim 1, abstract). Therefore, Li et al. inherently disclose a method of synchronizing the excitation of the ultrasonic sensor to a machining cycle (pulsed ECM).

In regards to amendment "such that the exciting and receiving are preformed during a plurality of machining off-times" in claims 1, 12 and 15, Li et al. discloses operation of the ultrasonic sensor during machining off-times (off cycle of pulsed ECM, col. 5, lines 40-45). While a plurality of ultrasonic measurements are not specifically disclosed, Li et al. inherently discloses making multiple measurements of the ultrasonic sensor in that the ultrasonic sensor is used in a method of ECM monitoring, and thus requiring multiple thickness measurements (claim 1, abstract). Furthermore, it is well understood that pulsed ECM has multiple off-time cycles.

Claims 3, 9, 19 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al.

In regards to claims 3 and 19, Li et al. does not specifically teach repeating reducing the potential difference across the electrode and the workpiece or using a pulsed power supply to generate a series of measurement periods. Since reducing the potential difference or being in a pulse-off state minimizes the generation of bubbles (col.5, lines 40-45), which consequently improves the accuracy of measurement, it would have been obvious to one of ordinary skill in the art to make multiple measurements in order to improve the accuracy of the measurement, especially

considering that accuracy improves as potential difference is reduced or is in a pulse-off state.

In regards to amendment "synchronizing" in claim 3, Li et al. inherently discloses synchronizing as stated above.

In regards to claims 9 and 21, Li et al. does not specifically disclose the use of at least two ultrasonic sensors, the second ultrasonic delaying the excitation by a dwell time plus an offset of at least the time required to attenuate the ultrasonic wave from the first ultrasonic sensor.

While Li et al. only specifically discloses one ultrasonic sensor to monitor the gap distance of one side of an airfoil in an electrochemical machining process (abstract, Figure 1), Li et al. does disclose two sides of an airfoil to be electrochemically machined (Figures 1 and 2). It would have been obvious to one of ordinary skill in the art to modify Li et al.'s electrochemical machining process to employ a second ultrasonic sensor on the second side of an airfoil in order monitor the gap distance of the second side of an airfoil (Li et al., abstract). Furthermore, with such a modification, Li et al. would teach exciting a first ultrasonic sensor to direct an ultrasonic wave towards a surface of one of the electrodes and exciting a second ultrasonic sensor to direct an ultrasonic wave toward a surface of another of the electrodes. Furthermore, including an offset time between ultrasonic sensor signal excitation is a necessary adjustment inherent to a control system employing multiple emitting/receiving sensors in order to avoid attenuation or interference.

Claim 3-7, 13-14, 16-17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. in view of Klocke et al. (US 2003/0079989).

In regards to claims 3 and 19, Li et al. does not specifically teach repeating reducing the potential difference across the electrode and the workpiece or using a pulsed power supply to generate a series of measurement periods. Since reducing the potential difference or being in a pulse-off state minimizes the generation of bubbles (col.5, lines 40-45), which consequently improves the accuracy of measurement, it would have been obvious to one of ordinary skill in the art to make multiple measurements in order to improve the accuracy of the measurement, especially considering that accuracy improves as potential difference is reduced or is in a pulse-off state.

In regards to claim 4-7, 13-14 and 16-17, Li et al. does not teach choosing a dwell time in the claimed range nor adjusting the dwell time in said method.

Klocke et al. teaches that when a pulsed electrochemical process is in its interrupted phase bubbles will that would inherently evolve will no longer evolve (paragraph [0076]). Also, impinging flow of electrolyte in a gas control system is employed to reduce bubble evolution (paragraph [0077]) as is employed in the instant application. These methods, alone or in combination, or in combination with other bubble reduction methods, shall be used to bring about the desired result of degree of bubble reduction (paragraph [0077]). While bubble reduction is not the claimed parameter in claims 4-7, one of ordinary skill would realize that dwell time is directly related to bubble minimization, in that, the longer the electrode is not energized, the

more time there is for impinging flow to clear the electrode surface of bubbles to allow an accurate measurement. It would have been obvious to one of ordinary skill in the art at the time of invention to optimize bubble reduction as taught by Klocke et al. in Li et al.'s method as Klocke et al. teaches that bubble reduction is a results-effective variable of several gas control methods (Klocke et al., paragraph [0077]). See MPEP 2144.05 II.

(10) Response to Argument

Appellant argues:

Li et al. does not disclose synchronizing the excitation of the sensor to a machining cycle of the ECM tool and Li et al. does not disclose delaying the excitation of the ultrasonic sensor a dwell time T_d after a reduction in potential across the workpiece and electrode.

Li et al. does not disclose the other of ultrasonic sensors is delayed by a dwell time plus an offset.

Li et al. does not disclose controlling at least one of the energizing and the feeding is response to the monitoring data.

Klocke et al. does not teach a dwell time.

Examiner responds:

Li et al. does not expressly disclose an active step of synchronizing the sensor to a machining cycle of the ECM tool. However, synchronizing is inherent in operation of the ultrasonic sensor with the ECM tool in that excitation of the ultrasonic tool is suggested during the off time interval of pulsed electrochemical machining (col. 5, lines 40-45). Multiple measurements of the ultrasonic sensor would be inherently made in

that the ultrasonic sensor is used in a method of ECM monitoring, and thus requiring multiple thickness measurements (claim 1, abstract). Therefore, Li et al. inherently disclose a method of synchronizing the excitation of the ultrasonic sensor to a machining cycle (pulsed ECM). Li et al. discloses operation of the ultrasonic sensor during machining off-times (off cycle of pulsed ECM, col. 5, lines 40-45). While a plurality of ultrasonic measurements are not specifically disclosed, Li et al. inherently discloses making multiple measurements of the ultrasonic sensor in that the ultrasonic sensor is used in a method of ECM monitoring, and thus requiring multiple thickness measurements (claim 1, abstract). Furthermore, it is well understood that pulsed ECM has multiple off-time cycles.

While Li et al. only expressly discloses one ultrasonic sensor to monitor the gap distance of one side of an airfoil in an electrochemical machining process (abstract, Figure 1), Li et al. does disclose two sides of an airfoil to be electrochemically machined (Figures 1 and 2). It would have been obvious to one of ordinary skill in the art to modify Li et al.'s electrochemical machining process to employ a second ultrasonic sensor on the second side of an airfoil in order monitor the gap distance of the second side of an airfoil (Li et al., abstract). Furthermore, with such a modification, Li et al. would teach exciting a first ultrasonic sensor to direct an ultrasonic wave towards a surface of one of the electrodes and exciting a second ultrasonic sensor to direct an ultrasonic wave toward a surface of another of the electrodes. Furthermore, including an offset time between ultrasonic sensor signal excitation is a necessary adjustment

inherent to a control system employing multiple emitting/receiving sensors in order to avoid attenuation or interference.

Li et al. expressly discloses one ultrasonic sensor to monitor the gap distance of one side of an airfoil in an electrochemical machining process (abstract, Figure 1). Furthermore, it is noted Li et al. discloses that tool feed rate, gap size and in-process gap detection or workpiece thickness detection is important for ECM process control. (col. 1, lines 49-52).

Klocke et al. teaches that when a pulsed electrochemical process is in its interrupted phase bubbles will that would inherently evolve will no longer evolve (paragraph [0076]). Also, impinging flow of electrolyte in a gas control system is employed to reduce bubble evolution (paragraph [0077]) as is employed in the instant application. These methods, alone or in combination, or in combination with other bubble reduction methods, shall be used to bring about the desired result of degree of bubble reduction (paragraph [0077]). While bubble reduction is not the claimed parameter in the instant claims 4-7, one of ordinary skill would realize that dwell time is directly related to bubble minimization, in that, the longer the electrode is not energized, the more time there is for impinging flow to clear the electrode surface of bubbles to allow an accurate measurement. It would have been obvious to one of ordinary skill in the art at the time of invention to optimize bubble reduction as taught by Klocke et al. in Li et al.'s method as Klocke et al. teaches that bubble reduction is a results-effective variable of several gas control methods (Klocke et al., paragraph [0077]). See MPEP 2144.05 II.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Nicholas A. Smith

Nicholas A. Smith

Patent Examiner

Art Unit 1753

Conferees:

Susy Tsang-Foster

Susy-Tsang Foster

Supervisory Patent Examiner

Art Unit 1753

Patrick Ryan

Supervisory Patent Examiner

Art Unit 1745